



Project Summary

US Army Engineer
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Public Affairs Office Ž 3909 Halls Ferry Road Ž Vicksburg, MS 39180-6199 Ž (601) 634-2504 Ž <http://www.wes.army.mil>

Factors Contributing to Louisiana Levee Failure

Principal Investigators: [Mr. Joseph Dunbar](#), (601) 634-3315

Objective: Identify the geologic and geotechnical causes of failure of a section of levee, and the mechanism of failure

Summary:

A section of levee along the Mississippi River near Marrero, Louisiana, failed in a non-flood-related event and involved replacing nearly 230,000 cu m of riverbank and levee. The data examined during research on the causes of levee failure included geologic setting, historic bank migration and previous bank lines, thalweg profiles, width/depth ratios, scour pool movement, and river profiles. The geology within the pertinent river reach and Holocene chronology of changes in the river channel profile were critically important factors in revealing the cause of levee failure. The Marrero or Celotex failure occurred within sandy point-bar deposits from a former distributary channel of the St. Bernard delta system. During historic time, the river channel narrowed appreciably in the failure reach, while maintaining a near-constant cross-sectional area. The general failure mechanism involved scouring and erosion of sand from the toe of the river bank, causing an over-steepened slope and resultant instability of the upper bank. That is, severe scour at the toe resulted as the thalweg deepened through the sandy substratum. Flow failure in the sands then led to loss of the upper bank or batture. Thus the location of the failure was controlled by the nature of the geologic deposits beneath the levee combined with progressive deepening of river channel at this location.



Significance:

Other locations along the lower Mississippi River, having similar geologic settings of ancient channel deposits on the concave side of the river, are likely to be susceptible to the same type of levee failure.

Report entitled “A Case History of Embankment Failure: Geological and Geotechnical Aspects of the Celotex Levee Failure New Orleans, Louisiana,” Technical Report GL-99-11, dated December 1999 by Joseph B Dunbar, Victor H. Torrey III, Lillian D. Wakeley, may be viewed at <http://libweb.wes.army.mil/lib/tr-gl-99-11.pdf>.